

**CONTINUOUS WEB OF PRE-OPENED MEDICAL BAGS**

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## CONTINUOUS WEB OF PRE-OPENED MEDICAL BAGS

### BACKGROUND OF THE INVENTION

The present invention generally relates to a continuous web of packaging bags. More specifically, the present invention relates to a continuous web of bags for use in packaging medical products utilizing automated bagging machines.

Presently, automated bagging machines have become popular for use in bagging various articles and products. Specifically, such bagging machines are configured to receive a continuous web of interconnected, pre-opened bags and to index the bags, one at a time, to a filling, sealing and separating station where appropriate products may be placed into the individual bags. After each bag has been filled, the bag is sealed and subsequently separated from the continuous web. Presently known bagging machines utilize plastic film bags for such an automated process.

Products being supplied to the medical industry are required to be packaged in sterile packaging. The industry typically utilizes individual bags each consisting of a plastic sheet of film bonded at selected locations to a sheet of porous substrate to define a pocket for receiving medical products. One such substrate is sold under the tradename Tyvek®

Typically, the sterile packaging bags are sold as single bags that must be filled one at a time. Thus, filling sterile bags with products takes a significant amount of time as compared to currently available systems that utilize automated bagging machines to load products into pre-opened bags connected as a web.

One method to provide a strip of sterile bags adapted for implementation with an automated bagging machine is shown in Baker U.S. Patent No. 6,419,392. In this patent, each of the bags includes a slit in the plastic film that transverses the entire open end of a pocket formed by a seal between the plastic film and a paper backing film. The opening in the plastic film extends across the entire width of the bag and allows product to be inserted into the bag when the bag is still connected to the continuous strip.

Although the web of bags shown in the '392 patent can be automatically loaded with product by an automated bagging machine, the opening formed in the plastic film extends across the entire width of the pocket, which presents challenges in opening and loading the bag with product. Further, since the opening in each of the bags is formed in the plastic film, the plastic film must face outward when utilized in an automated bagging machine. Thus, the heated sealing bar of the bagging machine contacts the paper backing layer during the sealing process, which results in an inadequate seal between the backing layer and the plastic film. Further, the heated sealing bar has a tendency to damage the paper backing layer.

As can be understood, a need currently exists for a continuous strip of bags that are pre-opened and allow sterile products to be inserted while being able to be used with currently available automated bagging machines. Further, a need exists for continuous strip of bags that can be utilized with different types of products where each bag has an opening that can vary depending upon the type of product being packaged.

#### SUMMARY OF THE INVENTION

The present invention is a continuous web of bags that are particularly useful in packaging sterilized products and can be used with an automated bagging machine. The continuous strip of bags includes a plurality of individual bags connected end-to-end where each of these bags is pre-opened and allows product to be inserted into each individual bag by automated bagging machines.

The continuous web of bag is formed from an elongated strip of base material adhesively attached to an elongated strip of plastic film. Preferably, the elongated strip of base material exhibits deadfold properties and can withstand the sterilization process. Specifically, the base material is selected from a group consisting of medical papers, spun-bonded olefin, and other types of heat sealable materials. The plastic film, preferably, is selected from a group consisting of high or low density polyethylene, polypropylene, or polyethylene-terephthalate.

The plastic film is adhesively bonded to the base material by using a continuous strip of adhesive material. Specifically, the adhesive bond defines a chevron-shaped bottom seal, a pair of spaced side seals and an open end.

Each of the bags formed along the continuous web is separable from  
5 the remaining portions of the continuous web along a line of perforation. The line of perforation extends through both the base material and the plastic film such that each of the bags can be separated from the web in a conventional manner. Each of the bags of the continuous web includes a die-cut formed in only the base material such that product can be inserted into each bag through the die-cut. The die-cut is  
10 formed in the base material and has a width such that the side edges of the die-cut are spaced inwardly from the side seals formed by the strip of adhesive. In this manner, the die-cut does not extend across the entire width of the continuous web such that the base material and plastic film are sealed to each other on opposite sides of the die-cut.

15 In the first embodiment of the invention, the die-cut is formed from a blank of material removed from the base material. The die-cut opening is defined by a pair of side edges that are each spaced slightly inwardly from the side seals of each bag. Preferably, the line of perforation extends through and bisects the die-cut opening. Thus, when each individual bag is separated from the continuous  
20 web, half of the die-cut opening remains with the bag currently being removed, while half of the die-cut opening remains with the next bag along the continuous web.

After the bag of the first embodiment of the invention is filled with product, a heat seal is created on the bag below the die-cut opening to seal the  
25 contents of the bag. Preferably, the automated bagging machine creates the heat seal by a heated sealing bar that contacts the plastic film, while a pressure bar contacts the layer of base material. In this manner, the heated sealing bar does not contact the base material, thereby preventing damage to the base material during the sealing process.

In a second embodiment of the invention, the die-cut is a die-cut slit formed only in the base material. The die-cut slit allows product to be inserted into each individual bag through a slit in the base material. Preferably, the die-cut slit includes ends that are spaced inwardly from the side seals of the bag such that the base material and plastic film remain sealed to each other on each side of the die-cut slit. Once a product has been inserted into the bag, a heat seal is formed beneath the die-cut slit such that the bag is completely sealed.

In a third embodiment of the invention, the die-cut is a die-cut opening having a transverse length substantially less than the width of the continuous web. A first area of perforation in the base layer extend between a first side edge of the die-cut opening and a side edge of the bag, while a second area of perforation in the base layer extends between the second side edge of the die-cut opening and the opposite side of the continuous web of bags. In the third embodiment, the user can control the size of the die-cut opening by utilizing a unique pair of fingers contained on the automated bagging machine. Specifically, the fingers of the automated bagging machine are inserted into the die-cut opening and can be separated to tear the base material along the first and second areas of perforation to increase the size of the die-cut opening. The moveable fingers can selectively expand the size of the die-cut opening only a very small amount or, if desired, expand of the die-cut opening almost entirely to the side seals formed between the plastic film and the base material. In this manner, the user can select the opening size depending upon the type of product to be inserted.

Various other features, objects, and advantages of the invention will be made apparent from the following detailed description and the drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

The drawings illustrate the best mode presently contemplated of carrying out the invention.

In the drawings:

Fig. 1 is a front view of a continuous web of bags formed in accordance with the present invention;

Fig. 2 is a section view taken along line 2-2 of Fig. 1;

Fig. 3 is a front view illustrating a single bag removed from the continuous web and sealed;

Fig. 4 is a schematic illustration showing the loading of the continuous web of bags formed in accordance with the present invention;

Fig. 5 is a continuation of Fig. 4 showing the sealing of each individual bag;

Fig. 6 is a front view of a second embodiment of a continuous web of bag formed in accordance with the present invention;

Fig. 7 is a section view taken along the line 7-7 of Fig. 6;

Fig. 8 is a front view illustrating a single bag removed from the continuous web and sealed;

Fig. 9 is a front view of a third embodiment of a continuous web of bag formed in accordance with the present invention;

Fig. 10 is a schematic illustration of the selective control of the width of the opening for each bag of the continuous web of bags;

Fig. 11 is a view similar to Fig. 10 showing the movement of a pair of fingers to modify the opening of the individual bag; and

Fig. 12 is an illustration showing the sealing and separation of a bag after filled with a product.

#### DETAILED DESCRIPTION OF THE INVENTION

Referring first to Fig. 1, there is shown a continuous web 10 of pre-opened, pre-formed bags, 12, 14 that are specifically configured for use with an automated bagging machine. Although only two bags 12, 14 are shown as being included in the continuous web 12 in Fig. 1, it should be understood that the continuous roll can include a larger number of individual bags connected in the end-to-end configuration shown in Fig. 1. For example, it is contemplated that the continuous web of pre-opened, pre-formed bags could include as many as 200 individual bags where the continuous web 10 is supplied in a roll for use with conventional automated bagging machines. Examples of such conventional

automated bagging machine are the MAX™ and SX™ models currently available from Sharp Packaging Systems, Inc. of Sussex, Wisconsin.

Each of the individual bags 12, 14 shown in Fig. 1 are specifically configured for receiving a product such that both the bag and the product can be subsequently sterilized. The bags 12, 14 are thus particularly useful in packaging medical products that can be subjected to a sterilization process after each of the bags 12, 14 has been filled.

As shown in Fig. 1, the continuous web 10 of bags has a width defined by a first side edge 16 and a second side edge 18. The overall width of the continuous web 10 between the side edges 16, 18 depends upon the type of bag being utilized and the type of product being inserted into each of the bags. As an example, the continuous web 10 may have a width of six inches in an exemplary embodiment of the invention.

As illustrated in Fig. 1, the bags 12 and 14 formed along the continuous web 10 are separated from each other by a line of perforation 20. The line of perforation 20 allows the bags 12 and 14 to be separated from each other once the product has been inserted into each of the bags. Although perforations are shown in the present embodiment, other methods of weakening the web to allow separation are contemplated, such as laser scoring.

Referring now to Fig. 2, each of the bags 12, 14 is formed from two discreet layers of material joined to each other by areas of adhesive. Specifically, each of the bags is formed from an elongated strip of base material 22 and an elongated strip of plastic film 24. The base material 22 and the plastic film 24 are adhesively bonded to each other by an area of adhesive 25.

Referring now to Fig. 1, the adhesive bond between the base material and the plastic film defines a pair of spaced side seals 26, 28 and a bottom seal 30. The bottom seal 30 has a chevron-shape as is conventional in sterile medical packaging. The side seals 26, 30 each extend along one of the side edges 15, 18 of each bag formed along the continuous web 10. The combination of the side seals 26, 28 and the bottom seal 30 define a pocket 32 in which the base material and

plastic film are not sealed to each other. The pocket 32 includes an open end 34 that allows product to be inserted into the pocket 32 in the manner to be discussed in greater detail below.

5 In the preferred embodiment of the invention, the base material 22 is a material that exhibits deadfold properties, which allows each of the bags to be loaded by an automated bagging machine without introducing wrinkles and folds into the base material 22 during loading. Typically, the base material 22 is a low porosity, long fiber paper having superior web strength such that the base material will remain intact if autoclaving is used. Alternatively, a paper-like material, such as Tyvek<sup>®</sup>, a spun-bonded olefin, will be used in the preferred embodiment of the invention. The spun-bonded olefin acts as a filter to prevent passage of recontaminating bacteria or the like through the base material while being sufficient permeable to gas. Additionally, the spun-bonded olefin exhibits deadfold properties such that it can be utilized with automated bagging machines.

15 In the prior art bags formed as a continuous web for packaging medical products, the plastic film layer 24 includes a slit across the entire transverse lip of the continuous web such that product can be inserted into bag through the slit in the plastic film. Such product is shown in the Baker U.S. Patent No. 6,419,392. Although the subject matter of the '392 patent presents a continuous roll of bags, the continuous roll exhibits numerous drawbacks which have been addressed by the present invention.

25 Referring back to Fig. 1, the continuous web includes a series of die-cut openings 36 formed along the continuous web. Each die-cut opening 36 is generally aligned with the open end 34 of the pocket 32. The die-cut opening 36 is formed in only the base material 22, as can be seen in Fig. 2. The die-cut opening 36 is provided to allow product to be inserted into the pocket 32. Since the base material 22 is material having deadfold properties, such as a spun-bonded olefin, the base material 22 is sufficiently durable to allow product to inserted without tearing.

Referring back to Fig. 1, the die-cut opening 36 is defined by a pair of spaced side edges 38 and 40. As illustrated in Fig. 1, the side edge 38 is spaced slightly inward from the side seal 26, while the side edge 40 is spaced slightly inward from the opposite side seal 28. Thus, both of the side edges 38, 40 are also spaced inwardly from the side edges 16, 18 of the continuous web 10. In the embodiment of the invention illustrated in Fig. 1, the die-cut opening 36 is formed from a blank of material removed from the base layer 22. The removed blank defines the die-cut opening 36 between the side edges 38, 40 and a top edge 42 and a bottom edge 44.

As illustrated in Fig. 1, the line of perforation 20 bisects the die-cut opening 36. Specifically, the line of perforation 20 is formed in the layer of plastic film at a location generally aligned with the die-cut opening 36. The line of perforation is also formed in the base material 22 in the area between the side edges 38, 40 of the die-cut opening 36 and the side edges 16, 18 of the continuous web. The line of perforation 20 thus allows the individual bag 14 to be separated from the individual bag 12 once the bag 14 has been filled and sealed in a manner to be discussed in detail below. As illustrated in Fig. 1, a portion of the die-cut opening 36 and small sections of the side seals 26, 28 remain at the bottom of the continuous web once an individual bag has been separated along the line of perforation.

Referring now to Fig. 3, once one of the bags 14 has been separated from the continuous web, the bag includes a top edge 46 and a bottom edge 48. The individual bag 14 is heat sealed along a seal line 50. The seal line 50 is spaced below the remaining portion of the die-cut opening 36 near the top edge 46 of the bag 15. Likewise, the top half of another die-cut opening 36 remains near the bottom edge 48 of the bag 14. The seal line 50 extends across the entire transverse width of the bag 14 from the side edge 16 to the side edge 18 to provide a complete seal across the open end 34.

The base material and the plastic film are attached to each other near the bottom end 48 by only the small portions of the side seals 26, 28. Thus, the

bag 14 can be opened by peeling apart the base material and the plastic film along the bottom edge 48. When the plastic film and the base material are peeled apart, the two layers separate along the chevron-shaped bottom seal 30 in a known manner.

5                   As can be understood in the embodiment shown in Figs. 1-3, the die-cut opening 36 has a length that extends across a substantial portion of the width of the continuous web 10. Thus, the die-cut opening 36 allows product to be inserted into the pocket 32 by an automated bagging machine.

10                   Referring now to Figs. 4-5, there shown is a schematic illustration of the loading process of the continuous web of bags formed in accordance with the present invention. As illustrated in Fig. 4, the plastic film side 24 of the continuous web 10 faces downward and contacts the drive roller 52. Thus, the strip of base material 22, which includes the series of die-cut openings 36, faces outward as the continuous web 10 is drawn around the drive roller 52.

15                   As the continuous web 10 is pulled around the drive roller 52, an air nozzle 54 directs a blast of air 56 to separate the base material 22 from the plastic film 24. Specifically, the air blast 56 passes through the die-cut opening 36 to open the pocket of each bag to be filled.

20                   Once the two layers of the continuous web 10 have been separated, product 58 can be inserted through the die-cut opening 36 as illustrated. In the embodiment shown in Fig. 4, the product 58 is a particulate matter, although it should be understood that various type of product can be inserted into the bags depending upon the particular application. For example, the product could be a medical instrument or any other product that needs to be packaged in a sterile  
25                   environment.

30                   Once the product 58 has been inserted into the individual bag, the continuous web travels to a sealing station that includes a heated, stationary seal bar 60 and a movable pressure bar 62. As illustrated in Fig. 5, the pressure bar 62 contacts the base material 22 and presses both the base material 22 and the plastic film 24 into the heated seal bar 60. The heated seal bar 60 forms a seal across the

entire bag. Once the bag has been sealed, the bag 14 is separated from the continuous web and includes the enclosed, inserted product.

As can be understood in Fig. 4 and 5, the continuous web 10 is formed such that the heated seal bar 60 contacts the plastic film 24, while the pressure bar 62 contacts the base material 22. In the preferred embodiment of the invention, the base material 22 is a spun-bonded olefin. Thus, it is important that the heated seal bar 60 contact the plastic film rather than the spun-bonded olefin to prevent damage to the spun-bonded olefin. In prior art systems, the opening to the individual bags was formed in the plastic bag film, which required the plastic film to be positioned outward. Thus, each of the bags in the prior art were presented such that the heated seal bar 60 contacted the base material, rather than the plastic film. The continuous web 10 of the present invention provides a significant improvement over the prior art systems.

Referring now to Fig. 6-8, there is shown a second embodiment of the present invention. The second embodiment of the present invention is similar to the first embodiment shown in Figs. 1-3 and similar reference numerals will be used throughout the foregoing description. In the second embodiment of the invention, the continuous web 10 is again formed from a base material 22 attached to a continuous strip of plastic film 24 by a layer of adhesive that defines the pair of side seals 26, 28 and the bottom seal 30. The adhesive seal defines an open end 34 for each of the bags.

Unlike the first embodiment, the second embodiment of the invention includes a die-cut slit 64 formed only in the base material 22. The die-cut slits 64 are spaced along the length of the continuous web such that each of the bags include one of the die-cut slits 64. In the embodiment of the invention illustrated, the die-cut slit 64 includes a pair of curved ends 66, 68 that are each spaced inwardly from the side seals 26, 28, respectively. The die-cut slit 64 allows the automated bagging machine to separate the layer of base material and the plastic film to insert product into the pocket 32 formed in each of the bags. Unlike the first embodiment, the die-cut slit 64 is not removed from the layer of base material,

but instead is simply a die-cut that allows access to the pocket 32 through the layer of the base material 22. Although the die-cut slit 64 shown in the embodiment in the invention illustrated in Figs. 6-8 includes curved ends 66, 68, it should be understood that the die-cut slit could have other forms while operating in the scope of the present invention.

In the embodiment illustrated, the length of the die-cut slit 64 is selected to allow many types and sizes of products to be inserted into each of the bags formed along the continuous web 10. The length of the die-cut slit 64 could be decreased depending upon the type of product to be inserted. A decrease in the length of the die-cut slit 64 would reduce the size of the opening available to insert the product, but also would reduce the tendency of the bag to buckle during the insertion process.

Referring now to Fig. 8, the bag 14, once separated from the continuous web, includes a heat seal 70 that is positioned beneath the die-cut slit 64 such that the open end 34 of the bag is sealed. As discussed previously, the base material and the plastic film are attached to each other near the bottom end 48 by only the small portions of the side seals 26, 28. Thus, the bag 14 can be opened by peeling apart the base material and the plastic film along the bottom edge 48. When the plastic film and the base material are peeled apart, the two layers separate along the chevron-shaped bottom seal 30 in a known manner.

Referring now to Figs. 9-12, there is shown a third embodiment of the present invention. In the third embodiment, the continuous web 10 is also formed from several individual bags joined in an end-to-end configuration. However, unlike the first embodiment shown in Figs. 1-3, the embodiment shown in Fig. 9 includes a die-cut opening 72 having a length between its side edges 74 and 76 that is significantly less than the length of the die-cut opening 36 shown in the first embodiment.

Referring now specifically to Fig. 9, the side edges 74, 76 of the die-cut opening 72 are spaced substantially inward from the pair of side seals 26, 28. Similar to the first embodiment, the third embodiment shown in Fig. 9 includes a

line of perforation 20 that bisects the die-cut opening 72. The line of perforation 20 defines a first area of perforation 78 and a second area of perforation 80 formed in the base material. The line of perforation 20 also extends completely across the plastic film as was the case in the first embodiment shown in Figs. 1-3. As can be  
5 seen in Fig. 9, the first area of perforation 78 extends from the side edge 74 of the opening 72 to the side edge 16 of the web 10, while the second area of perforation 80 extends from the side edge 76 of the die-cut opening 72 to the side edge 18 of the continuous web 10.

In the embodiment of the invention illustrated in Fig. 9, the die-cut  
10 opening 72 has a substantially smaller size than the first embodiment such that only small product can be inserted into the pocket 32 utilizing the insertion method shown in Figs. 4 and 5. This type of die-cut opening 72 allows granular and small products to be inserted into each of the individual bags without the bags rippling or folding during opening. Rippling or folding is a possibility due to the width of the  
15 die-cut opening 36 shown in the first embodiment of Figs. 1-3. Thus, the embodiment shown in Fig. 10 increases the effectiveness of the individual bags of the continuous web 10 to receive small and granular products.

In the embodiment of the invention illustrated, it is contemplated that the user can vary the width of the die-cut opening by utilizing a unique loading  
20 device, which is schematically shown in Figs. 10-11. In Fig. 10, a pair fingers 82, 84 are installed on the automated bagging machine and used during the filling process shown in Figs. 4 and 5. Prior to the product being inserted into the bag, each of the fingers 82, 84 are inserted into the die-cut opening 72 such that the end 86 of each finger 82, 84 is received between the two layers of the individual bag.

25 Once the fingers 82, 84 have been inserted into the die-cut opening 72, the fingers 82, 84 are moved toward the side edges 16, 18 of the continuous web, as shown by the arrows 88, 90 of Fig. 11. As the fingers 82, 84 move in this direction, the fingers 82, 84 tear the base material along the first area of perforation 78 and along the second area of perforation 80. The fingers 82, 84 are used to  
30 effectively expand the width of the die-cut opening 72 based upon the user

requirement. As can be understood in Fig. 11, the user can select the width of the die-cut opening by controlling the distance the fingers 82, 84 are moved toward the lateral edges of the continuous web.

5 After the width of the die-cut opening 72 has been expanded by the movable fingers 82, 84, product can be inserted into the individual bags using the steps discussed in Figs. 4 and 5. The use of the movable fingers 82, 84 enhances the usefulness of the single web of bags shown in Fig. 9, such that a single web can be used with a wider array of product sizes while providing an optimal opening for each.

10 Once the product has been inserted into the individual bag 14, a heat seal 92 is created beneath the die-cut opening 72 in the same manner as described as the first embodiment of Figs. 1-3.